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OPERATING EXPERIENCE WEEKLY SUMMARY

Office of Nuclear and Facility Safety

October 2 - October 8, 1998

Summary 98-40

Operating Experience Weekly Summary 98-40

October 2 through October 8, 1998

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EVENTS

1. SPREAD OF CONTAMINATION AT HANFORD

On September 28, 1998, at the Hanford site, a health physics technician was performing a routine surveillance and discovered contamination levels of as much as 1,000,000 dpm of predominately stronium-90 in a mobile trailer office/kitchen. Electricians used the trailer as an office and a break area. The technician determined that several items in the trailer were contaminated, including a cutting board, a countertop, a bench-seat, the floor, garbage cans and their contents, door handles, toilet handles, and food wrappers. The technician established a radiological control area and notified the facility manager. Health physics technicians performed additional surveys and determined that several trash dumpsters and an iron workers' shop were also contaminated. They also determined that the trash from one of the dumpsters was collected and dumped at the city of Richland landfill before the technicians had a chance to post it as contaminated. They subsequently determined that two of Hanford's dump trucks and the trash in them are contaminated; the trucks and their contents have been placed under radiological control. Technicians also detected contamination at the landfill and implemented radiological material controls until they can develop and implement removal plans agreed upon with state and local officials. (ORPS Reports RL--PHMC-FSS-1998-0021 and RL--PHMC-WESF-1998-0012)

Investigators conducted surveys of workers identified as having been in the trailer. They determined that one worker's boot and some of his personal effects were contaminated; they also found four contaminated socks at his home. Investigators believe that the contamination is being spread from a 10-acre area near B-Plant/Waste Encapsulation and Storage Facility because it is the only place on site that contains strontium-90. Facility personnel have roped off and posted this 10-acre area as a radiological buffer area. Although investigators have not determined the exact source of contamination or how the contamination is being spread, they believe that workers and ecological transport (ants, mice, fruit flies, etc.) are responsible for the spread of contamination. They will continue to identify if additional contamination has spread and will attempt to find the contamination source and transport mechanism. The facility manager will determine corrective actions as necessary.

NFS has reported contamination events in several Weekly Summaries. Some examples follow.

- Weekly Summary 97-20 reported that subcontract construction workers at the Sandia National Laboratory excavated an area containing radiologically contaminated soil without following the required radiological work controls. Radiological control technicians took surface probe readings of the area and detected 100 to 400 dpm for the disturbed soil and 100 to 4,000 dpm for the soil within a 50-foot radius of the excavation. The hazard assessment for the work required a radiological work permit for excavations deeper than 6 inches and required notification of Radiation Protection Operations personnel before starting. The subsequent investigation indicated that these elements of the hazard assessment had not been implemented. (ORPS Report ALO-KO-SNL-NMFAC-1997-0005)

- Weekly Summary 97-16 reported that workers at the Mound Plant contaminated their gloves and boots while taking core samples from an asphalted area with known subsurface contamination. The workers were not wearing anti-contamination clothing. The boots of five workers had alpha contamination of 325 dpm to 4,200 dpm and the gloves of two workers had 450 dpm and 350 dpm. Investigators determined that planners had failed to include protective clothing in

the specifications for working in contaminated soil. (ORPS Report OH-MB-EGGM-EGGMAT04-1997-0003)

- Weekly Summary 94-47 reported two contamination events at the Lawrence Berkeley Laboratory. The first event involved an individual who spilled radioactive phosphorus on his clothing and carried it off-site. The second event involved an individual who traveled off-site with radioactive sulfur-35 on his shoe. (ORPS Reports SAN--LBL-LSD-1994-0004 and SAN--LBL-LSD-1994-0005)

OEAF engineers searched the ORPS database for events that involved a loss of control of radioactive material or spread of contamination from January 1990 to the present and found 3,494 occurrences. Figure 1-1 shows the distribution of root causes. Managers reported 46 percent of the root causes as management problems and 17 percent as radiological/hazardous material problems. Of the management problems, 52 percent were reported as due to inadequate administrative control. Of the radiological/hazardous material problems, 77 percent were reported as legacy contamination events.

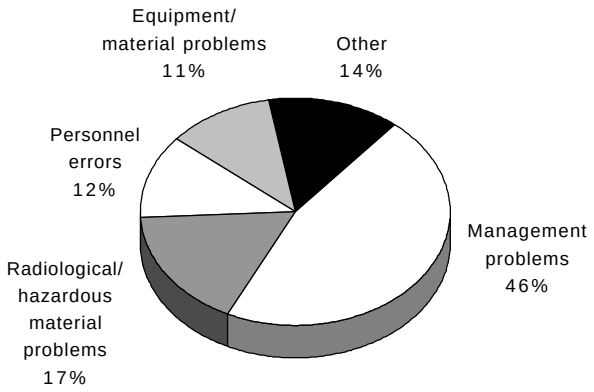

Figure 1-1. Root Causes of Loss of Control of Radioactive Material Events[1]

These events emphasize the importance of strong radiological control programs and how the lack of effective oversight and work planning can affect worker safety. Line managers are responsible for adequate planning and control of work activities. They should ensure that work control processes are followed and contamination mechanisms are planned for and evaluated. Management and integrating contractors need to closely supervise subcontractors that perform construction and maintenance work at DOE facilities. They should ensure that subcontractor personnel have completed the required training and understand all hazards associated with the job and the workplace. Management and integrating contractors should also provide safety oversight of subcontractor administrative controls, safety programs, and work plans to ensure that subcontractor personnel work safely and in a safe environment.

Personnel at DOE facilities should have a continually questioning attitude toward safety issues. Each individual is ultimately responsible for complying with rules to ensure personal safety. Facility managers should communicate the idea that safety is of prime importance and that all personnel must be committed to excellence and professionalism. Personnel in charge of radioactive material should review the following guidance and ensure that materials are stored so that personnel exposures and the spread of contamination events do not occur.

[1] OEAF engineers searched the ORPS database using the graphical user interface for reports with a nature of occurrence code of "1D" (loss of control of radioactive material or spread of contamination) from January 1990 to present and found 3,494 events.

- DOE/EH-256T, *Radiological Control Manual,* requires control and accountability for sealed radioactive sources. It states: "Each person involved in radiological work is expected to demonstrate responsibility and accountability through an informed, disciplined, and cautious attitude toward radiation and radioactivity." The manual sets forth DOE guidance on the proper course of action for radiological control, including work preparation; work controls; monitoring and surveys; and training and qualifications. Section 123, "Worker Responsibilities," states that trained personnel should recognize that their actions directly affect contamination control, personnel radiation exposure, and the overall radiological environment associated with their work. Most of the pertinent radiological protection requirements have become codified in 10 CFR 835, *Occupational Radiation Protection*.

- DOE/EH-0420, "Events Involving Undetected Spread of Contamination," provides guidance, good practices, and corrective actions to prevent the spread of contamination. This notice also contains information on common contributing causes, including (1) failure to follow applicable radiological protection procedures; (2) failure to adequately perform required surveys; (3) inadequate training for personnel involved in the handling and use of radioactive material; (4) failure of radiation protection personnel to properly identify, analyze, and respond to the event; (5) failure to exercise appropriate precautions when handling radioactive material; (6) inadequate supervision or management oversight of activities involving the handling and use of radioactive material; and (7) inadequate identification of existing contamination. This notice can be obtained by contacting the ES&H Information Center, (800) 473-4375, or by writing to the U.S. Department of Energy, ES&H Information Center, EH-72, 19901 Germantown Road, Germantown, MD 20874. It can also be found on the Internet at http://tis.eh.doe.gov:80/web/oeaf/tools/hazbar.pdf.

Links to DOE radiation protection documents can be found at http://tis-nt.eh.doe.gov/wpphm/regs/regs.htm.

KEYWORDS: accountability, radiation protection, procedure

FUNCTIONAL AREAS: Radiation Protection, Procedures, Materials Handling/Storage

2. RESPIRATOR PROTECTION COUPLING NUTS FAIL

In September 1998, at the Fluor Daniel Hanford site, a respirator protection program administrator discovered that five fractured Mine Safety Appliance (MSA) coupling nuts had recently been found on 19-inch hood breathing tubes, three of which were new and still in the manufacturer's boxes. The tubes have plastic coupling nuts on both ends that connect Powered Air-Purifying Respirators (PAPR) to MSA blower units. The respirator protection program administrator notified MSA personnel of the fractured coupling nuts. They determined that the failures had resulted from a solvent attack on the polycarbonate material during the manufacturing process. These failures are similar to three failures that occurred at Hanford two years ago. Failure of the coupling nuts could result in radiological uptakes.

Investigators determined that all of the nuts have fractured horizontally and that all of the failures have been associated with MSA OptimAir 6 PAPR (see Figure 2-1). Respiratory protection personnel restricted use of these models and the MSA product lines manager has stopped all

shipments of this PAPR until the anomaly can be resolved. MSA personnel will change to a solvent-resistant plastic for manufacturing of the coupling nut. They will also issue field inspection test instructions so all PAPR that contain the polycarbonate coupling nuts can be checked before use. In addition, respiratory protection personnel have notified the National Institute for Occupational Safety and Health of the coupling nut failure.

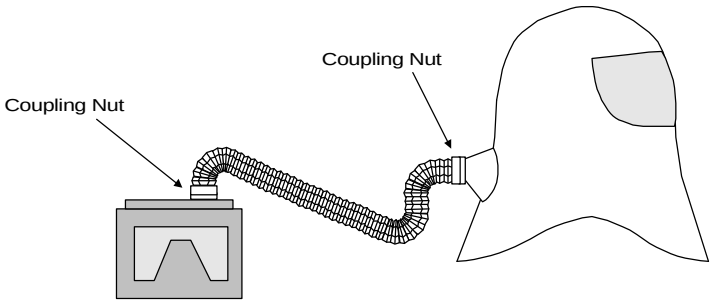

Figure 2-1. MSA OptimAir 6 PAPR

NFS reported coupling nut failures at Hanford in Weekly Summary 96-18. On April 26, 1996, a T-Plant nuclear process operator reported three discoveries of fractured MSA coupling nuts on 19-inch hood breathing tubes. (ORPS Report RL--WHC-TPLANT-1996-0005) OEAF engineers reviewed a similar event at Hanford in Weekly Summary 96-18. In that event a T-Plant operator experienced reduced airflow through his replaceable hood shell, which was connected to a hood breathing tube and a powered air-purifying respirator. He checked the coupling nut and found that it rotated freely. Initially, Hanford investigators thought the reduced airflow coupling nut failure was caused by an overtightening of the nut. (ORPS Report RL--WHC-TPLANT-1995-0030) T-Plant investigators also determined that the failures continued to occur on replacement coupling nuts supplied by MSA. MSA later identified several deficiencies in the coupling nut production process and implemented actions to correct these deficiencies.

Facility managers and personnel in charge of training workers on respirator usage should emphasize the importance of carefully checking for respirator defects before entering areas that require respiratory protection. Personnel who wear respirators should ensure that they understand and implement the correct methods of wearing, operating, and checking the respirators. DOE/EH-0256T, *Radiological Control Manual*, 29 CFR 1910.134, *Respiratory Protection,* and ANSI Z88.2-1992, *Respiratory Protection*, discuss equipment and requirements of respiratory protection programs and provide additional references.

For more information on the coupling nut failures, contact Cliff Ledford, Fluor Daniel Hanford Respiratory Protection Program administrator at (509) 373-5214 or e-mail at troy_c_cliff_ledford@rl.gov. MSA maintains a website at http://www.msanet.com.

KEYWORDS: coupling, nuts, radiation protection respirator

FUNCTIONAL AREAS: Radiation Protection, Industrial Safety

3. 480-VOLT ELECTRICAL CABLE SEVERED DURING EXCAVATION ACTIVITY

On September 30, 1998, at the Portsmouth Gaseous Diffusion Plant, maintenance personnel severed an energized 480-volt cable with a backhoe during excavation activities, causing a circuit breaker to trip. Maintenance personnel immediately stopped all excavation activities and notified the appropriate management personnel of the event. Management personnel directed electricians to identify the cable and tag out the breaker. They determined that the cable supplied power for a sewage lift station. Management personnel issued a stop work for all excavation activities until an investigation could be completed. Although there were no injuries from this incident, installing a lockout/tagout would have provided a positive barrier for worker safety. (ORPS Report ORO--BJC-PORTENVRES-1998-0017)

Investigators determined that maintenance personnel were excavating to repair a recirculating hot water line. Maintenance personnel referenced blueprints and used utility locators to find buried utilities in the construction area and found the recirculating hot water line, an air line, a cathodic protection cable, a sewer line, and an electric conduit in the construction area using blueprints and utility locators. They performed surveys after each pass of the backhoe and detected underground utilities each time until they excavated through an area that contained gravel and into a clay area. They then incorrectly assumed that there was no possibility of additional buried cable being present, so they did not perform any more surveys to verify if additional cables were present.

The facility manager held a critique of this event. Critique members learned that although the blueprints showed that the severed cable was buried in conduit, in fact it was not. Members learned that because yellow protective tape had been found around the cathodic protection cable, maintenance personnel expected that similar tape would be present if any additional cables existed. They also learned that no one had instituted any lockouts or tagouts before beginning work. The facility manager will continue to review this event and will determine corrective actions that are necessary.

NFS has reported severed cables and excavation events in several Weekly Summaries. Some examples follow.

- Weekly Summary 97-44 reviewed three occurrence reports about inadequate work controls and pre-job planning during excavation activities. On October 22, 1997, at the Hanford Site, a plant maintenance worker received a slight shock from a heat-traced line while excavating a potable water line. Investigators determined that the workers knew the heat-tracing was present. However, they did not lock or tag out the line because they did not expect to contact it. On October 23, 1997, at the Idaho National Engineering Environmental Laboratory, a construction worker struck and damaged an energized 480-volt cable with a backhoe, interrupting power to three buildings. Investigators determined that procedural violations and communication errors had contributed to this event. On October 27, 1997, at the National Institute for Petroleum and Energy Research, a construction worker severed a natural gas line with a trenching machine, resulting in evacuation of the area. Investigators determined that the as-built drawings incorrectly identified the line depth. (ORPS Reports RL--PHMC-KBASINS-1997-0023, ID--LITC-LANDLORD-1997-0017 and HQ--GOPE-NIPER-1997-0005)

- Weekly Summary 97-41 reported that a subcontractor's backhoe operator at a Los Alamos National Laboratory construction site pulled two de-energized 480-volt cables through a conduit with the teeth of the backhoe bucket and across an

energized bus bar. When the backhoe operator saw sparks, he immediately raised the bucket and moved the backhoe out of the area. Investigators determined that poor communication between the backhoe operator and a crew of electricians was responsible for the incident. The backhoe operator incorrectly believed the electricians had already cut the cable to allow its removal. (ORPS Report ALO-LA-LANL-LANL-1997-0001)

- Weekly Summary 97-33 reported four events where workers severed underground electrical and telephone lines. At Hanford, a subcontractor renovating a building basement cut a conduit containing an energized 110-volt line. At Lawrence Livermore National Laboratory, a contractor cut an underground energized 480-volt line while using construction equipment to loosen the soil surface. At the Hanford Waste Encapsulation and Storage Facility, a backhoe operator performing excavation severed an abandoned underground telephone line. When work resumed the next day, the backhoe operator severed an abandoned, de-energized electrical cable. (ORPS Reports RL--PHMC-WESF-1997-0007, RL--PNNL-PNNLBOPER-1997-0023, and SAN--LLNL-LLNL-1997-0051)

These events underscore the importance of using effective work control practices and detailed job planning to provide multiple levels of protection. Safety and health hazard analysis in the work control process will help prevent worker injury. Pre-job briefings, facility procedures, and training programs should emphasize the dangers associated with excavation activities. Many events have occurred while personnel were digging, trenching, or drilling.

The Portsmouth event is significant because maintenance personnel had initially performed the standard procedures for identifying buried hazards: they obtained an excavation permit, they used locating devices for utility detection, and they had reviewed blueprints. However, no one (1) requested a lockout/tagout after utilities had been identified by the survey, (2) requested a survey to verify if additional cable was present in the ground below the gravel, or (3) isolated the cable with a lockout. In addition, maintenance personnel performed the excavation with a backhoe when they knew from the survey that utilities were present. Utilities must be properly marked so equipment operators do not severe them; if they are not marked, digging should be completed by hand, using insulated tools. Lockout/tagout programs in DOE serve two functions. The first function, defined in both 29 CFR 1910, *Occupational Safety and Health Standards*, and DOE O 5480.19, *Conduct of Operations Requirements for DOE Facilities,* is to protect personnel from injury and protect equipment from damage. The second function is to provide overall control of equipment and system status. OSHA standard 29 CFR 1910 states that an effective lockout/tagout program requires three elements. These elements are as follows: (1) all affected personnel must understand the program; (2) the program must be applied uniformly in every job; and (3) the program must be respected by every worker and supervisor. A good lockout/tagout program is an important element of an effective conduct of operations program.

DOE facility managers should ensure that personnel understand the basics of work control practices, work planning, and safety and health hazard analysis. Many references apply to these events. Facility managers should ensure that the following references are incorporated in their safety programs.

- DOE O 5480.19 states that DOE policy is to operate DOE facilities in a manner to ensure an acceptable level of safety and that procedures are in place to control conduct of operations. Chapter VIII, “Control of Equipment and System Status,” provides an overall perspective on control of equipment and system status. Specific applications of system control are addressed in chapter IX, “Lockout/Tagout,” and chapter X, “Independent Verification.”

- DOE-STD-1030-96, *Guide to Good Practices for Lockouts and Tagouts*, provides guidance on lockout/tagout program implementation and management at DOE facilities.

- OSHA 29 CFR 1926, *Safety and Health Regulations for Construction,* sub-parts .651(b) and .416(a)(3), assigns employers responsibility for identifying underground hazards and energized circuits near the work area. The requirements of 29 CFR 1926.956(c) state that work must be conducted in a manner to avoid damage to underground facilities. Similarly, work must be performed in a manner that protects the workers.

- *Construction Safety Reference Guide*, section B.8, discusses requirements for a lockout/tagout program for construction activities. This section of the guide endorses OSHA regulations contained in 29 CFR 1910.147, "The Control of Hazardous Energy (Lockout/Tagout)," and indicates where OSHA training requirements are mandatory.

NFS has prepared and issued three documents that provide guidance for these events. DOE facility representatives, managers, and personnel responsible for construction safety programs may want to review these documents to assist in implementing effective programs.

- DOE/EH-0540, Safety Notice No. 96-05, "Lockout/Tagout Programs," summarizes lockout/tagout events at DOE facilities, provides lessons learned and recommended practices, and identifies lockout/tagout program requirements.

- The *Hazard and Barrier Analysis Guide* includes a hazard-barrier matrix showing that lockout/tagout is the most effective barrier to injury. When implemented properly, lockout/tagout provides a high probability (greater than 99 percent) of success for risk reduction. The guide discusses different kinds of barriers: physical barriers, procedural or administrative barriers, or human action. The reliability of a barrier is related to its ability to resist failure. Barriers can be imposed in series to provide defense-in-depth and to increase the margin of safety. The guide provides detailed guidance for selecting optimum barriers, including a matrix that displays the effectiveness of different barriers in protecting against some common hazards.

- DOE/EH-0541, Safety Notice 96-06, "Underground Utilities Detection and Excavation," provides descriptions of recent events, an overview of current technology for underground utility detection, specific recommendations for improving programs for utilities detection in connection with excavation programs, and information on innovative practices used at DOE facilities. The notice states that a central coordinator should not only assist in identifying underground utilities but should also record the findings.

Safety Notices 96-05 and 96-06 can be obtained by contacting the ES&H Information Center, (800) 473-4375, or by writing to U.S. Department of Energy, ES&H Information Center, EH-72, 19901 Germantown Road, Germantown, MD 20874. Safety Notices are also available on the OEAF Home Page at http://tis.eh.doe.gov:80/web/oeaf/lessons_learned/ons/ons.html. A copy of the *Hazard and Barrier Analysis Guide* may also be obtained by contacting the ES&H Information Center.

KEYWORDS: barrier, excavation, cable, electrical shock

FUNCTIONAL AREAS: Industrial Safety, Hazards and Barrier Analysis, Construction

4. CONTAMINATED WASTE DRUM AND WORK AREA AT ROCKY FLATS

On September 23, 1998, at the Rocky Flats Environmental Technology Plutonium Processing and Handling Facility, workers discovered radiological contamination on the outside of a drum and in a general work area during nitric acid transfer and drum triple-rinsing operations. Workers normally monitor for contamination only at the end of a shift because the facility usually handles waste drums with little or no radioactivity. However, the content of one drum was significantly radioactive, which workers did not discover until they monitored for contamination after handling the next drum in line. They called a radiological controls technician, who measured contamination levels of up to 8,400 dpm alpha and ordered workers to leave the area. The facility manager directed evolution supervisors to terminate transfer and rinsing operations. Technicians detected no skin contamination, and the results of nasal smears were negative. The results of bioassay samples are pending. If workers had not performed an interim survey for contamination, the radiological consequences of this occurrence could have been much more serious. (ORPS Report RFO--KHLL-371OPS-1998-0072)

Investigators determined that during rinsing operations, workers receive 55-gallon drums containing low-level acid waste from another building and consolidate it for treatment. They then clean the drums for reuse by removing the bungs, pumping out the contents, introducing a few gallons of rinse water, and rolling the drums from side to side, releasing small amounts of fluid from the drums.

The facility manager organized a critique of this event, and attendees learned the following.

- Workers received the contaminated drum as one of a group of five. Characterization documents were available for the first four drums but were missing for this drum. The evolution supervisor left the work area to locate the characterization documents but became involved in other activities and did not return immediately. He did not advise operators not to process the undocumented drum.

- Workers were accustomed to little or no radioactivity in waste drums and had not expected high radioactivity levels. Had they been aware of the nature of the drum content, they would not have processed it using the standard work procedure.

- When workers began processing the next drum, they noticed the contents were unusually dark in color, possibly indicating the presence of oil, which the process will not handle. Workers dipped absorbent material into the drum for a closer inspection of the liquid without procedural guidance. When they monitored for contamination afterward as a precautionary measure, they discovered the contamination that had been released from the preceding drum.

- Supervisors who sent the barrel to the transfer and rinsing operation knew its radioactivity level but did not advise recipients of that level.

- Work planners did not include radiological or industrial safety controls in the work instructions and did not meet the preparation standards of the site documents requirements manual.

- Radiological controls personnel did not perform a pre-job survey of the drums and work area required by the radiation work permit.

NFS has reported occurrences of personnel contamination attributed to deficiencies in work planning and control in several Weekly Summaries. The following are some examples.

- Weekly Summary 98-26 reported that the DOE Office of Enforcement and Investigation issued two Preliminary Notices of Violation under the Price-Anderson Amendments Act for an uncontrolled europium contamination event that occurred at the Idaho National Engineering and Environmental Laboratory on September 17, 1997. The event resulted in the contamination of six workers and the entire facility. The staff identified multiple procedure violations, ALARA violations, and radiological control violations. (ORPS Report ID--LITC-TRA-1997-0021)

- Weekly Summary 97-39 reported that six workers at the Idaho National Engineering Environmental Laboratory performing maintenance on a remote-handling manipulator in the hot cell facility were contaminated with europium. The facility was also contaminated. Radiological controls personnel measured approximately 260,000 dpm in the location with the highest level of contamination. Two workers received uptakes of 10 to 30 mrem 50-year committed effective dose equivalent. Investigators determined that workers had violated the work procedure and exceeded the limitations of the radiation work permit. They identified the root cause of this event as a failure on the part of managers to communicate their expectations for review and approval of work documents and oversight of facility operations. (ORPS Report ID--LITC-TRA-1997-0021)

These events underscore the importance of ensuring that work control practices and job planning processes adequately address the hazardous activities that could lead to personnel exposure or contamination. In this event, not only did the evolution supervisor fail to require workers to stop work when he realized he had received a drum with no supporting documentation, but the workers performed actions unsupported by the procedure at hand when they discovered an apparent abnormality with another drum. Both of these as-found conditions were anomalies that should have triggered immediate work stoppage. Managers and supervisors in charge of job performance should develop procedures that provide comprehensive direction to workers under both normal and abnormal conditions. They should ensure that hazards associated with facility operations are identified and included in prerequisites, procedure steps, and precautionary statements. DOE facility managers should ensure that personnel understand work control practices and safety and health hazard analyses. The following references contain guidance for work planning and control.

- DOE O 5480.19, *Conduct of Operations Requirements for DOE Facilities*, states that DOE policy is to operate its facilities in a manner to assure an acceptable level of safety and to ensure procedures are in place to control conduct of operations. Chapter XVI, “Operations Procedures,” states that the requirements for use of procedures should be clearly defined and understood by all operators.

- DOE O 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*, describes the required elements of a worker protection program at DOE facilities. Section 14.a(2) of attachment 2, “Contractor Requirements Document,” states that workers shall be informed of foreseeable hazards and required protective measures before starting work on the affected operation.

- DOE G 450.4-1, *Integrated Safety Management Guide*, provides extensive guidance to DOE contractors for developing, describing, and implementing an integrated safety management system to comply with DOE policy and acquisition rules. The guide addresses core functions and guiding principles related to defining scope of work, analyzing hazards, developing and implementing controls, and performing work at the facility, project, or activity level.

- DOE/EH-0256T, *Radiological Control Manual*, states: “Each person involved in radiological work is expected to demonstrate responsibility and accountability through an informed, disciplined, and cautious attitude toward radiation and radioactivity.” The manual sets forth DOE guidance on the proper course of action in the area of radiological control, including work preparation, work controls, monitoring and surveys, and training and qualifications.

- DOE-STD-1029-92, *Writers Guide for Technical Procedures,* provides guidance to help writers across the DOE complex to produce accurate, complete, and usable technical procedures that promote safe and efficient operations. This guidance can also be applied to other technical documents, such as work plans.

KEYWORDS: contaminated waste, drum, job planning, procedure, work control

FUNCTIONAL AREAS: Operations, Procedures, Radiation Protection, Work Planning

FINAL REPORTS

This section of the OE Weekly Summary discusses events filed as final reports in the ORPS. These events contain new or additional lessons learned that may be of interest to personnel within the DOE complex.

1. UNPLANNED REACTIVITY ADDITION DURING REACTOR STARTUP

On July 21, 1998, at the Idaho National Environmental and Engineering Laboratory, an operator performing a normal reactor startup at the Advanced Test Reactor Critical Facility saw a larger rate of power increase than expected following a momentary outer shim control cylinder withdraw. When he observed the increasing rate, he moved the rod control switch to the "insert" position. However, the outer shim control cylinders did not immediately insert because of designed cylinder gear backlash. Electronic circuits that monitor reactor power conditions caused automatic safety rod and outer shim control cylinder insertion when reactor power was increasing by a factor of 2.7 each 15 seconds. Reactor power immediately reversed direction. The reactor manager observing the startup directed the operator to manually shut down the reactor. Operator intervention and safety interlocks mitigated the consequences of this unplanned reactivity addition. A maintenance program that incorporates vendor recommendations might have made these actions unnecessary. (ORPS Report ID--LITC-ATR-1998-0015)

Investigators performed a control system interlock check as a means of checking the outer shim control cylinder control circuits. They noted minor coasting of the outer shim control cylinders after release of the withdraw switch, which suggested a small delay in the relay returning to its de-energized state could be prolonging withdrawal. They inspected the interlock relays in the control rod permissive circuits. Before the relays had been disassembled for inspection, they noticed that the outer shim cylinder withdraw relay plunger would not operate smoothly through full travel when the relay coil was de-energized. Technicians removed the coil and found a greenish sticky substance on the stem.

The reactor manager determined that the most probable direct cause of this occurrence was the slow operation of one or more outer shim control cylinder withdraw relays (Square D, Model DO-42). The manufacturer, which discontinued making this type of relay in 1969, has recommended that no lubricant be applied to it. An equipment/material problem, contaminant, is listed as the direct cause because six outer shim control cylinder withdraw relays showed evidence of sticking when manually positioned. Other relays also showed signs of sticking and moved freely after they were cleaned and refurbished. The reactor manager identified personnel error, inattention to detail, as the root cause because technicians had lubricated the rod control relays, contrary to manufacturer recommendations. Facility personnel reviewed the facility records back to 1989 and did not identify any entries dealing with the lubrication of the relays.

NFS reported in Weekly Summary 96-14 that a chemical reaction between the plasticizer in polyvinyl chloride insulation and copper wire used in electrical applications produced a green substance. The substance was observed in old wires and relays at commercial nuclear power stations and at the Savannah River Site. It is a hazard because it can leak from between the insulation and the wire and cause short circuits, embrittle insulation, and interfere with electrical component operation. (DOE Lessons Learned List Server Item 1996-SR-WSRC-LL-0003)

This event illustrates the importance of thorough conduct of maintenance procedures that adhere to manufacturer recommendations. The impact of maintenance on the design basis of a system and on existing facility systems and processes needs to be thoroughly reviewed. Facility managers should ensure that all personnel are aware of the need for detailed maintenance reviews by subject matter experts. DOE 4330.4B, *Maintenance Management Program,* discusses establishing effective programs for the management and performance of effective maintenance and repair. Section 5.2 of the order addresses planned preventive maintenance to ensure that equipment operates within the designed operating conditions. The order includes guidance for using vendor recommendations to predict component degradation and allow for replacement before failures.

KEYWORDS: relay, circuit, lubricant

FUNCTIONAL AREA: Electrical Maintenance

2. WORKER MAKES RADIOLOGICAL ENTRIES WITHOUT DOSIMETRY

This week OEAF engineers reviewed a final occurrence report about a contract worker at the Hanford site nuclear waste disposal operations facility who entered radiological buffer areas at least 14 times between October 1997 and June 1998 without a dosimeter. Investigators determined that the worker was not issued a dosimeter when she performed work in radiological buffer zones. Failure to wear dosimetry when working in a radiological area could result in unmonitored doses that exceed safe limits. (ORPS Report RL--PHMC-WSCF-1998-0001)

Investigators determined that the contract worker was qualified as a Radiation Worker II in November 1995. They learned that she had originally been hired to perform administrative duties, and she was not issued a dosimeter because the radiological work permit for administrative work did not require dosimetry. However, in October 1997, her job responsibilities expanded to include work in radiological buffer areas, where the radiological work permit did require dosimetry. Investigators reviewed the radiological work permits in the site database and found that the thermoluminescent dosimetry box had been checked, indicating that the worker was required to use a dosimeter. They also determined that the worker did not understand that the radiological work plan required a dosimeter and that her signature in the access logbook meant that she had read and understood the plan.

Investigators determined that the root cause of the event was inattention to detail by both the worker and her manager. When the worker's duties were expanded to include work in potential radiological areas, the manager did not thoroughly analyze the worker's qualifications and did not ensure that she had the appropriate dosimetry.

Investigators determined that the direct cause of the event was personnel error. The worker did not understand that she would need a new radiological work permit when her duties changed.

This event illustrates the need for training coordinators, facility managers, and access control system administrators to review program records and controls. Such training would ensure that personnel are qualified and certified for the tasks to which they are assigned. Managers should also be aware of changing work conditions that result in a change of access requirements, and workers should be taught to understand these requirements and ensure that they are met. Supervisors should be able to easily track the status of worker training and to schedule training as needed. The following references contain applicable guidance for radiological worker requirements.

- DOE O 5480.20, *Personnel Selection, Qualification, Training, and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities,* sets forth requirements for ensuring that all workers are qualified to carry out their assigned responsibilities. The Order sets forth requirements for developing and maintaining training to meet position requirements, and requirements for initial and continuing training.

- DOE/EH-0256T, *Radiological Control Manual,* section 123, provides specific guidance on radiological worker responsibilities. Managers at facilities with radiation areas should review their programs to ensure that workers are aware of and comply with this guidance.

- 10 CFR 835.902, *Radiological Workers*, states that radiological worker training programs and retraining shall be established and conducted at intervals not to exceed two years to familiarize workers with the fundamentals of radiation protection and the (As Low As Reasonably Achievable) ALARA process. Training shall include both classroom and applied training.

- DOE-STD-1060-93, *Guide to Good Practices for Continuing Training*, chapter 7, requires auditable records of personnel training. It also states that supervisors “should have access to qualification records, as necessary, to support the assignment of work to qualified personnel."

KEYWORDS: access control, administrative control, radiological work permit, training and qualifications

FUNCTIONAL AREAS: Radiation Protection, Training and Qualification

OEAF ACTIVITY

The DOE Office of Operating Experience Analysis and Feedback (OEAF) (EH-33) will sponsor a 3-day Data Analysis Forum to be held January 26 to 28, 1999, in Las Vegas, NV, at the St. Tropez Hotel.

Those who should attend this meeting include DOE Federal and contractor personnel and other Federal agencies and contractors who collect, analyze, report, and/or use operational data in their work for the Federal government.

The purpose of this forum is to share innovative techniques for collecting meaningful data, analyzing data to reveal useful insights, and presenting clear, concise results so that decision makers can act and/or the public can be informed. Presentations will provide specific products or ideas that attendees can take back to work with them. The objectives of the forum are as follows:

- Share successful tools and techniques used to collect, validate, analyze, and present DOE operational data (so that others may emulate them).
- Share knowledge of available data sources in the DOE complex at both the local as well as the corporate level.
- Share lessons learned (both good and bad) in collecting, validating, analyzing, and presenting results.
- Promote the utilization of standard and innovative methods for data analysis to better evaluate DOE operational data.

Papers and presentations are currently being solicited for the Data Analysis Forum by a Call for Papers. Topical areas may include Data Collection, Data Analysis, and Presentation of Results. There are three ways to present information at the 1999 Data Analysis Forum: (1) by making a stand-alone presentation; (2) by leading or participating in a panel discussion or facilitated discussion; or (3) by providing a display in the Analysis Display Area.

Additional information on submitting a paper, online registration, and hotel information can be found on the OEAF Home Page at http://tis.eh.doe.gov/web/oeaf/workshop. The deadline for submitting proposals is October 28, 1998. Presenters will be notified of selection results by November 11, 1998.

If you have any questions about the 1999 DOE Operating Experience Data Analysis Forum, please contact one of the following:

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